THE 25TH ANNUAL HAROLD I. SCHIFF LECTURE

FACULTY OF SCIENCE

Presented by:

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Quantification of Volcanic Gas Emission by Optical Spectroscopy – How and Why

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103 Life Science Building

York University

Abstract: Volcanoes play an enormous role for the Earth system and for our atmosphere. Therefore, volcanic gas emissions are studied not only out of scientific curiosity. In addition to their influence on the atmosphere composition and emission rate of volcanic gases are a window to processes occurring in the Earth's interior, also volcanic eruptions forecast can be improved by measuring variations of gas emissions ratios e.g. CO_2/SO_2 or BrO/SO_2. In recent years spectroscopic quantification of gas emissions from volcanoes and other sources made enormous progress. In particular passive spectroscopic approaches observing volcanic gases based on their observation of scattered sun-light in the ultra-violet (UV) spectral range evolved from an art to mature techniques. For instance UV spectrometers form the heart of the Network for Volcanic and Atmospheric Composition Change (NOVAC), which since about a decade routinely monitors more than two dozen volcanoes by fully automated installations. Also thermal emission spectroscopy is becoming important for case studies. A drawback of techniques relying on solar radiation is the limitation of their observations to daylight hour. Here novel techniques like bi-static Light-Emitting-Diode LIDAR (LIght Detection And Ranging) system promises to offer the possibility to make range resolved measurements of emission plumes. A first demonstration set-up could measure atmospheric NO_2 concentrations in Heidelberg, Germany, here an extension of the principle to SO_2 in emission plumes is presented. We give an overview of the available techniques for the quantification of volcanic gas emission by optical spectroscopy, discuss sample results, and give an outlook on future developments.

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